Rethinking Luminaires: Drivers

Jeremy Yon, LC
Manager, Product Innovation
jeremy.yon@litecontrol.com

What is a LED Driver?

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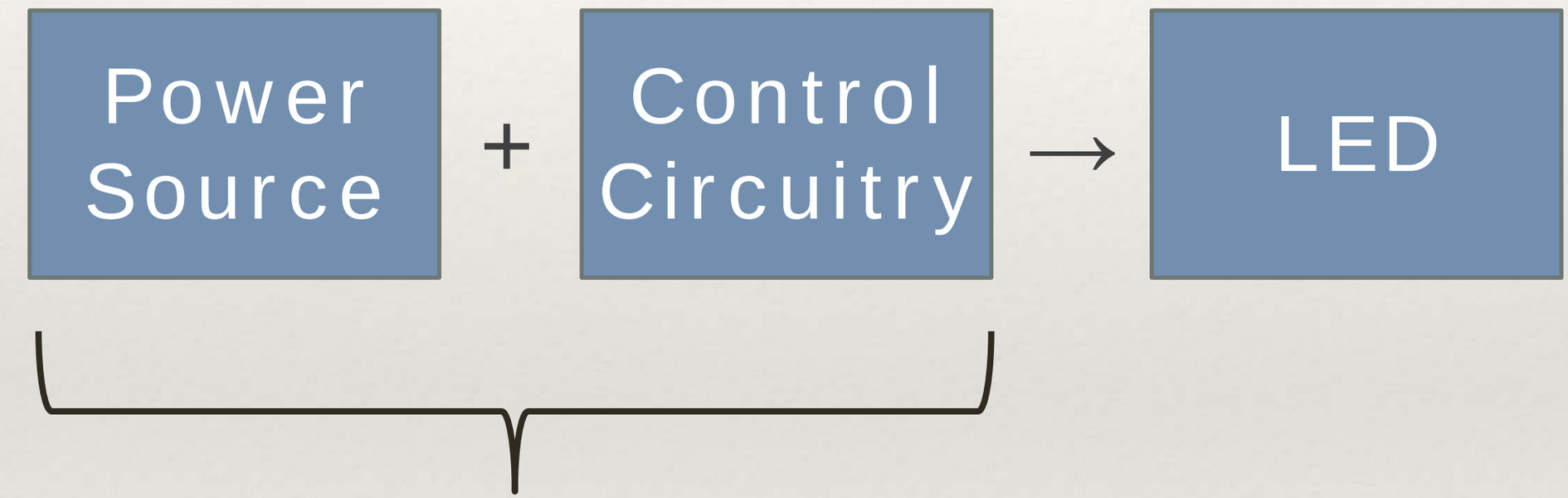
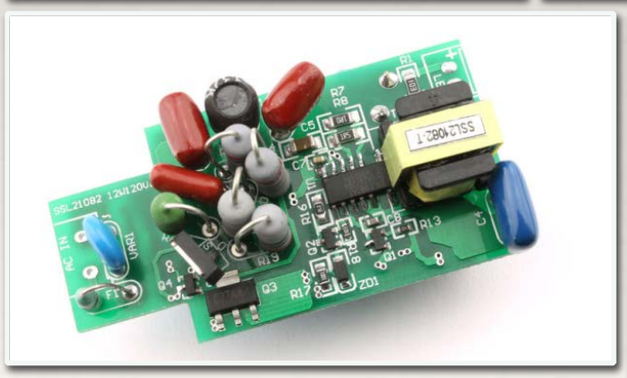
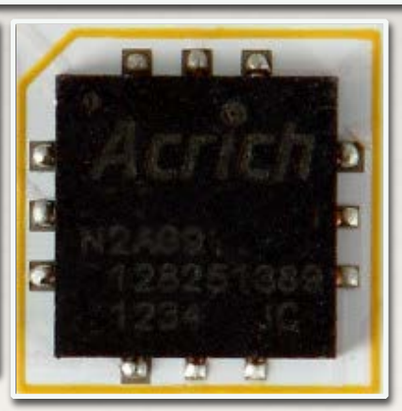


What is a LED Driver?

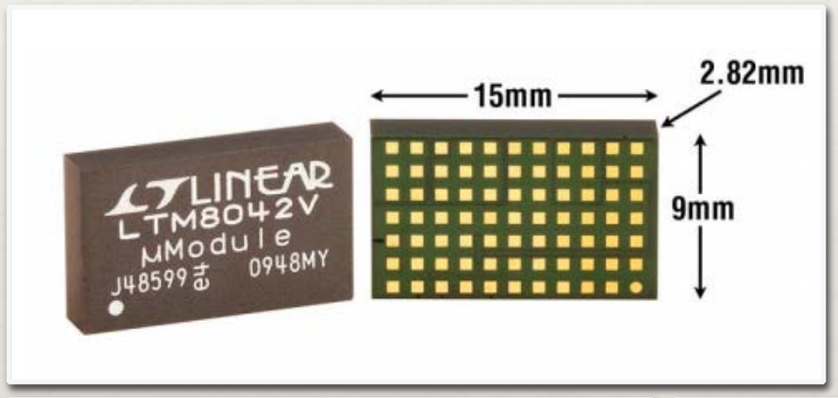
(colloquial definition)

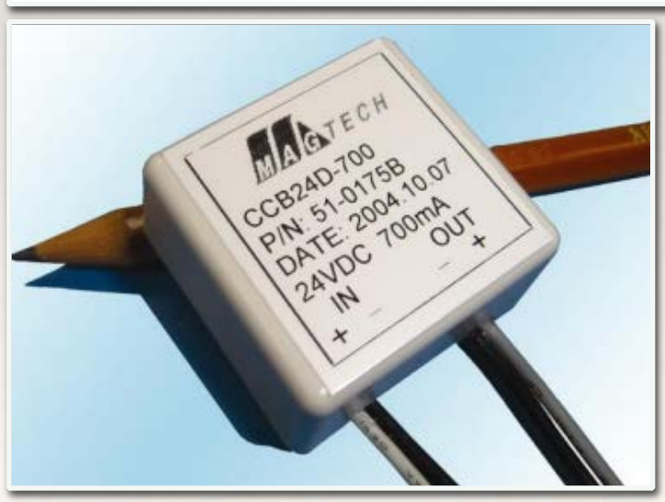
AC-DC
Conversion + Regulation





DC-DC
Regulation

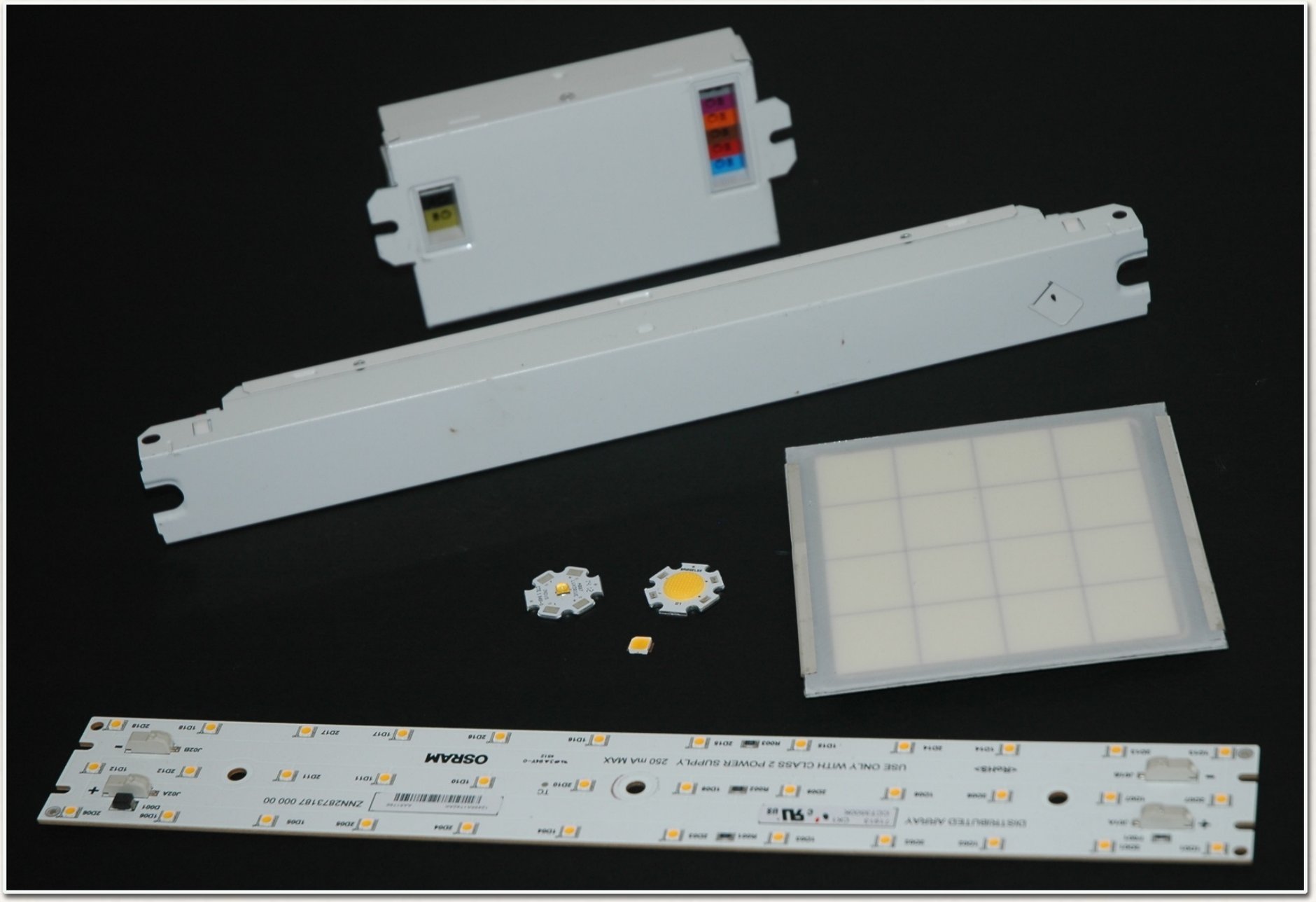




Rethinking Luminaires: Drivers

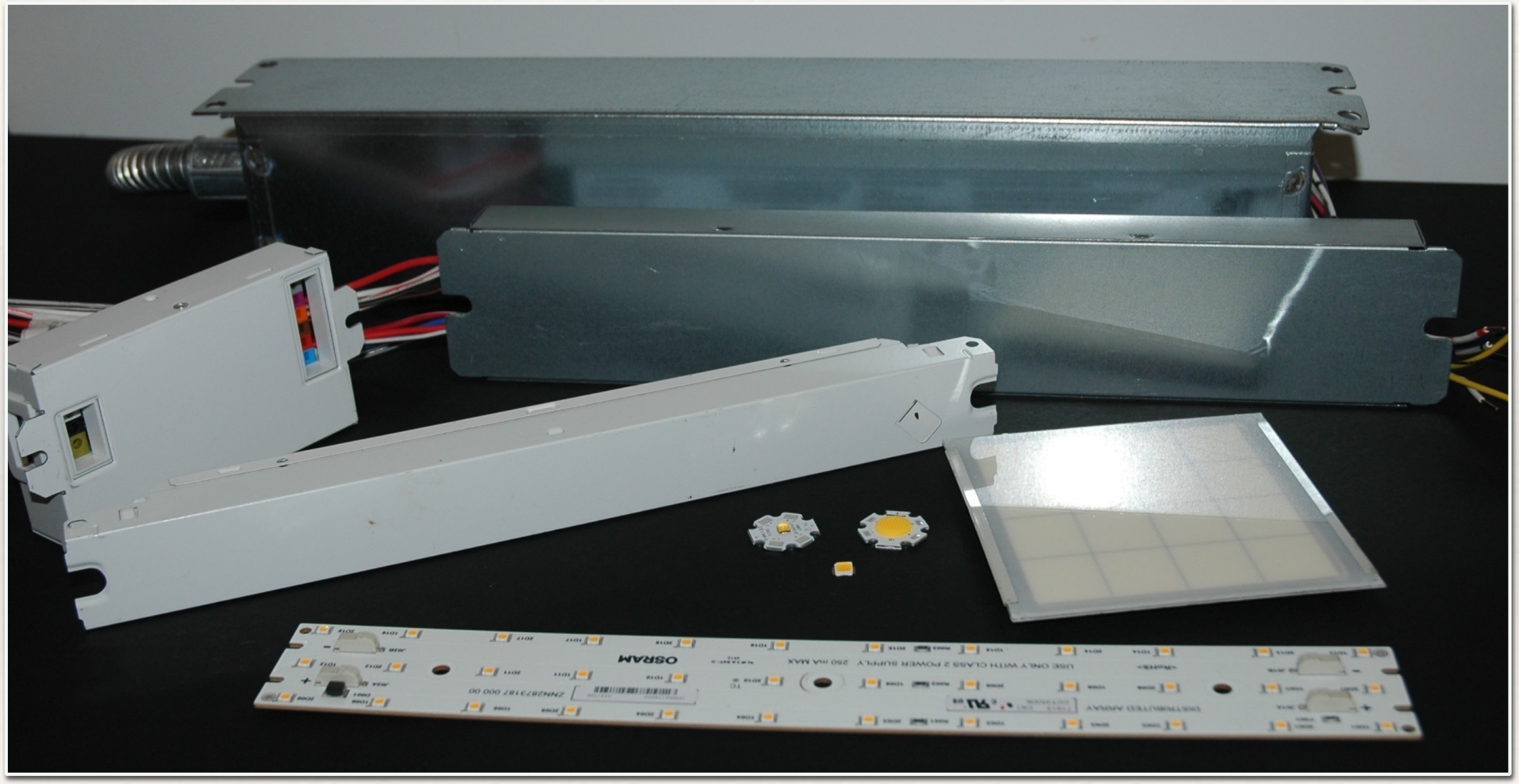
What are the Challenges?

Challenge: Size



Challenge: Certification

Challenge: Emergency



Challenge: Agreeing on Reliability

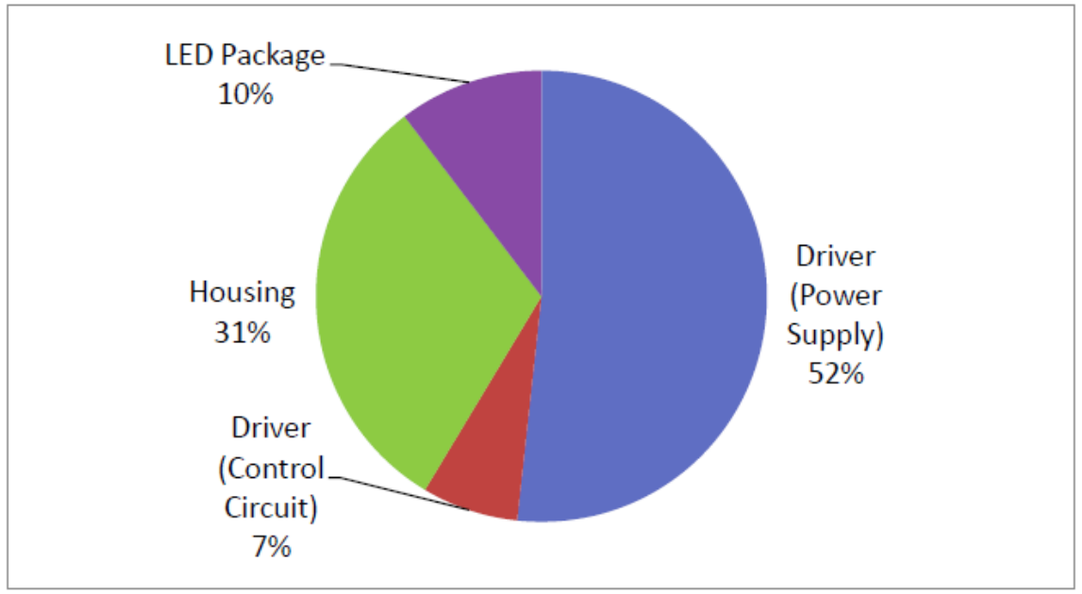


FIGURE 3. DISTRIBUTION OF FAILURES IN 34M OPERATING HOURS FOR A FAMILY OF OUTDOOR LUMINAIRES. TOTAL NUMBER OF FAILURES WAS 29, OR 0.56% OF INSTALLED BASE OF APPROXIMATELY 5,400 FIXTURES.
SOURCE: APPALACHIAN LIGHTING SYSTEMS, INC.

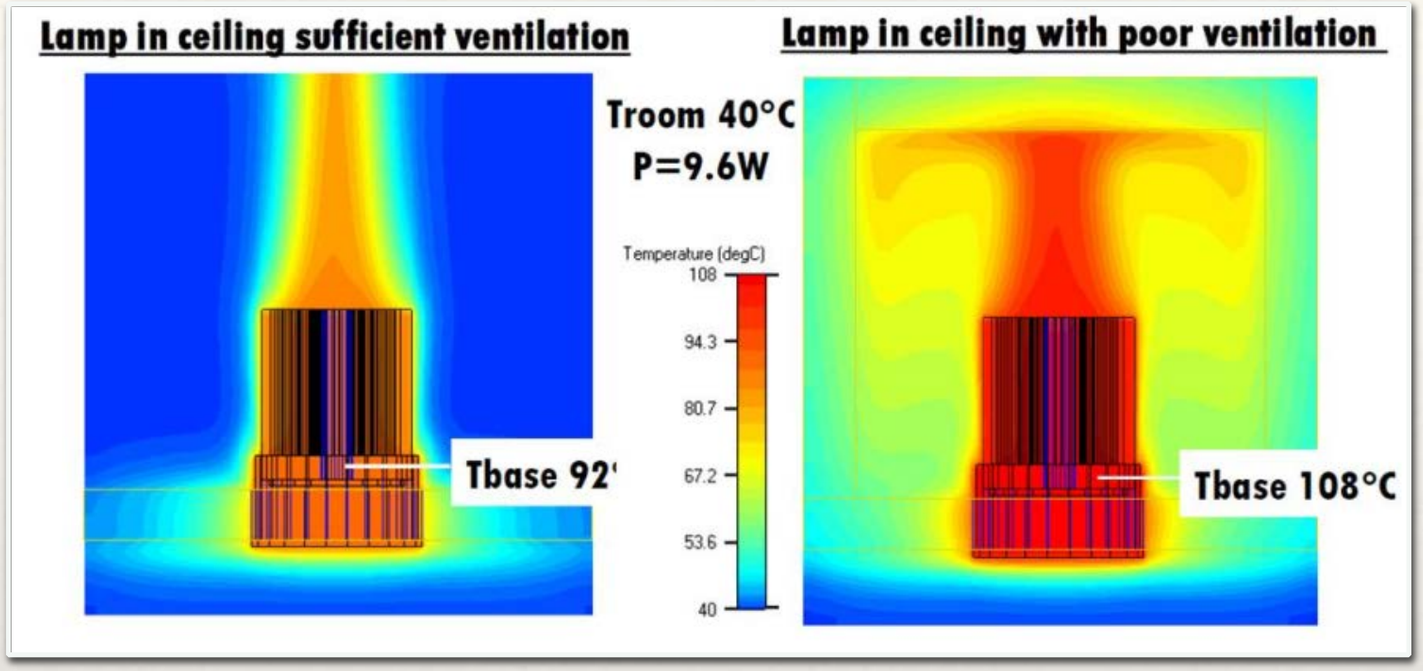
NGLIA/DOE: LED Luminaire Lifetime, 2011

This unit is designed with a life time > 50,000 hours at 25°C (ambient temperature) with a nominal input (120V/230/240/277Vac) voltage. The Mean Time Between Failures (MTBF) of the power supply shall be calculated by parts stress method of MIL –HDBK-217F, with an ambient temperature of 25°C; MTBF is ≥ 100,000 hours at 25°C (ambient temperature) and 50,000 hours at 50°C (ambient temperature).

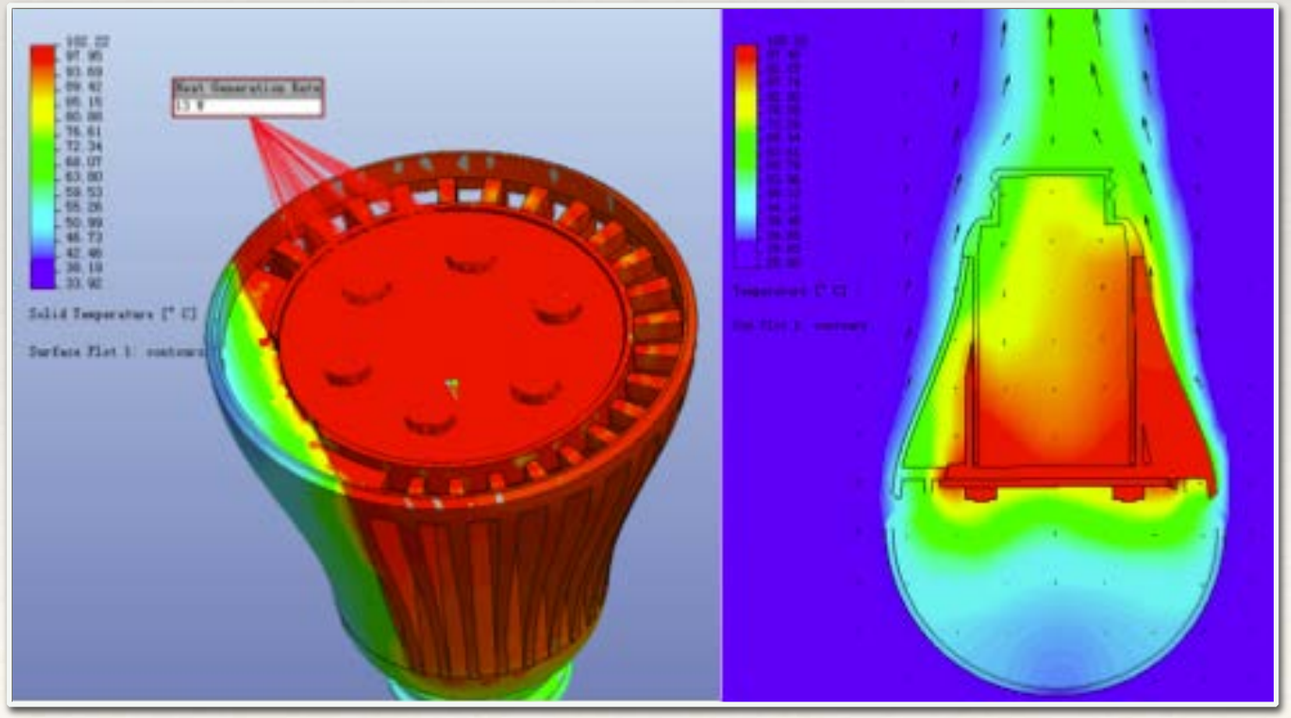
For 50,000 hour lifetime, driver case temperature (t_c) must not exceed 65 °C.

System Warranty Period
60 months

Challenge: Ambient Temperature



ledworld.co.nz



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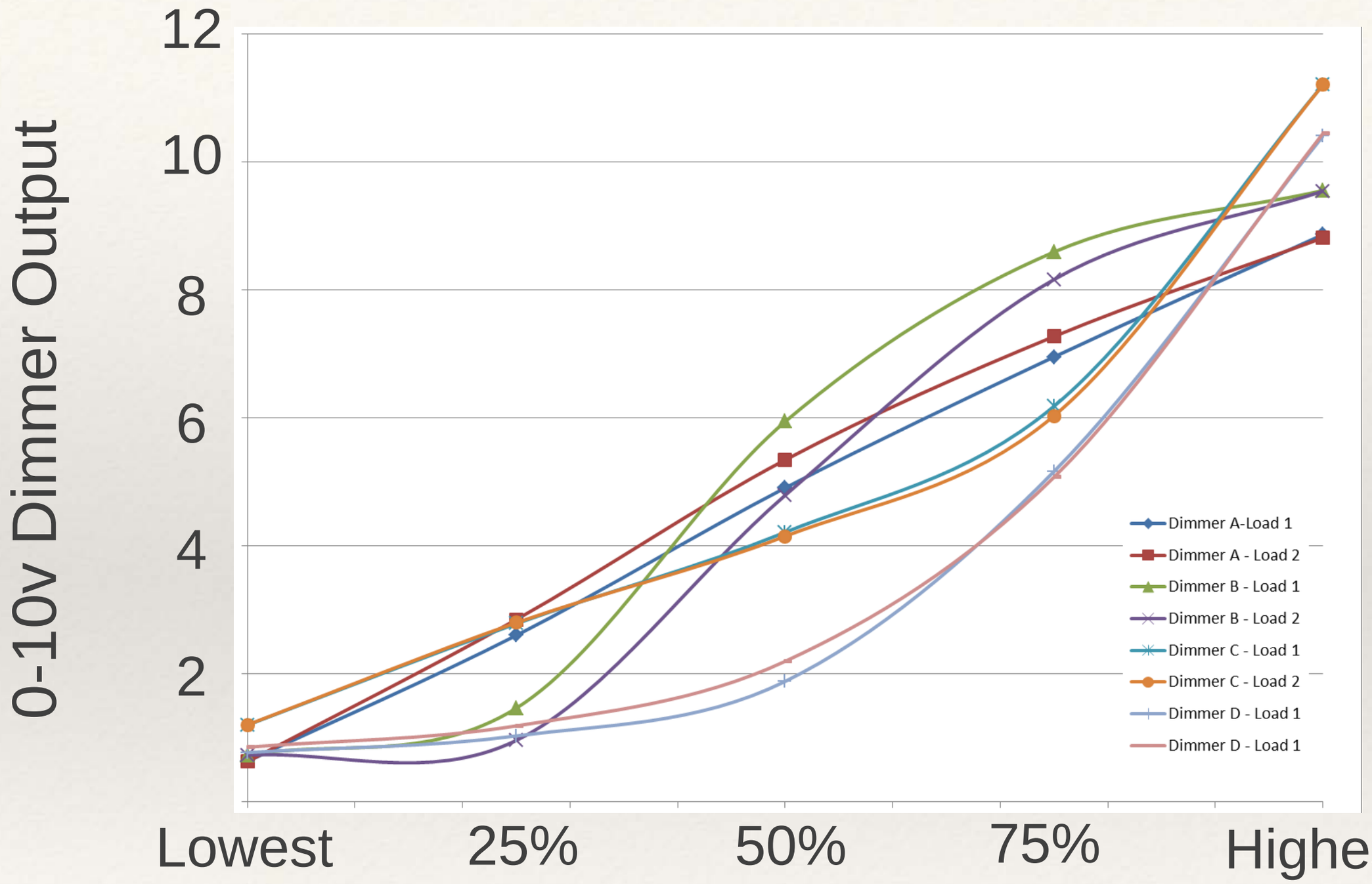
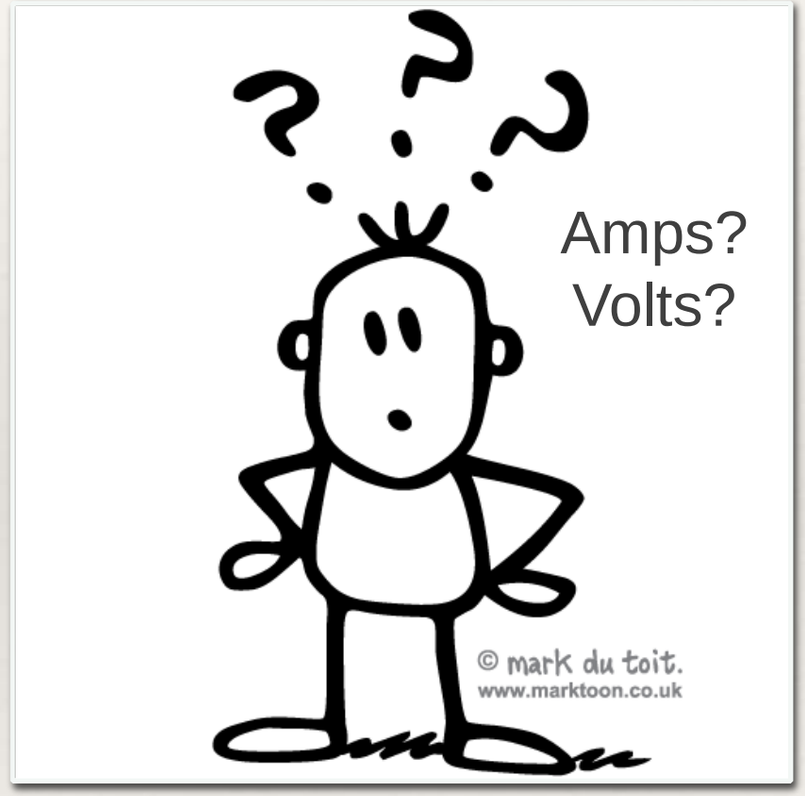
Challenge: Dimming



Jeremy Yon, Litecontrol &
Michael Poplawski, PNNL

Challenge: Future Support



Can High Efficiency in a Single Device be Achieved?

High Efficiency Drivers

2013 MYPP Driver Efficiency Goals
LED: 92%
OLED: 95%

Efficiency

- Flexibility
- Cost
- Components

High Efficiency Drivers

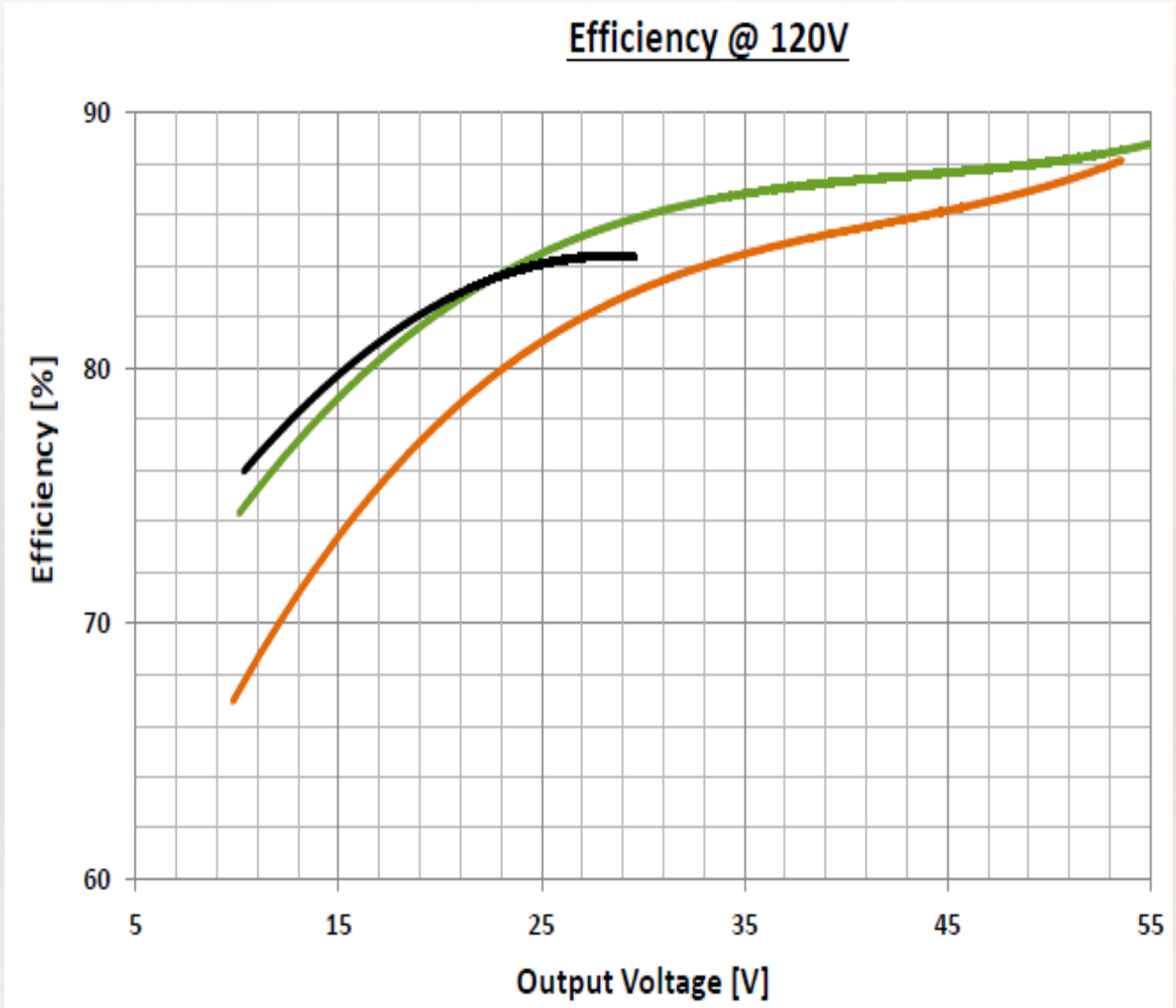
Flexibility

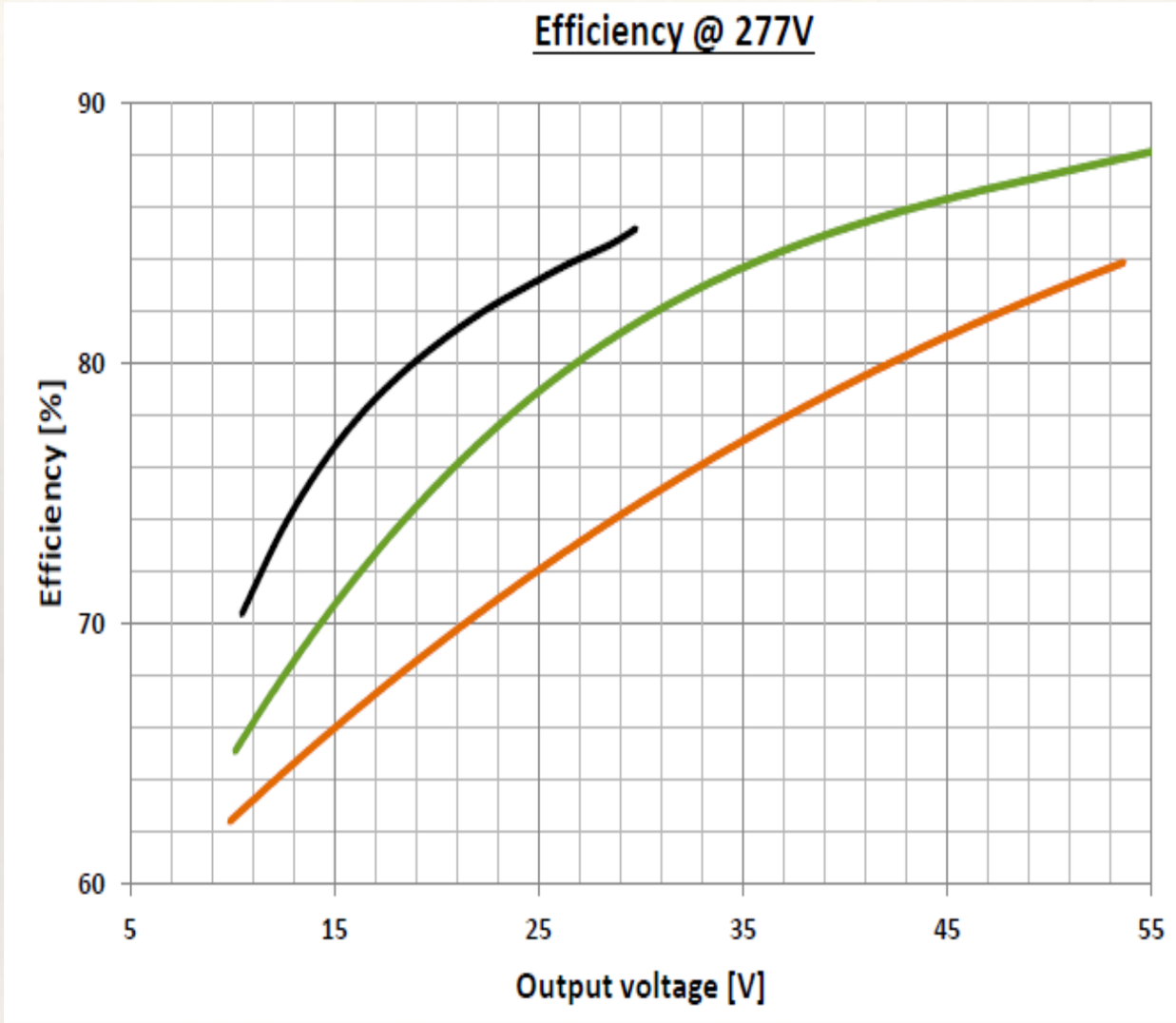
120 – 277 VAC
50 – 60 Hz

15 - 30 Watts
350 – 1250 mA
10 – 56 VDC

High Efficiency Drivers

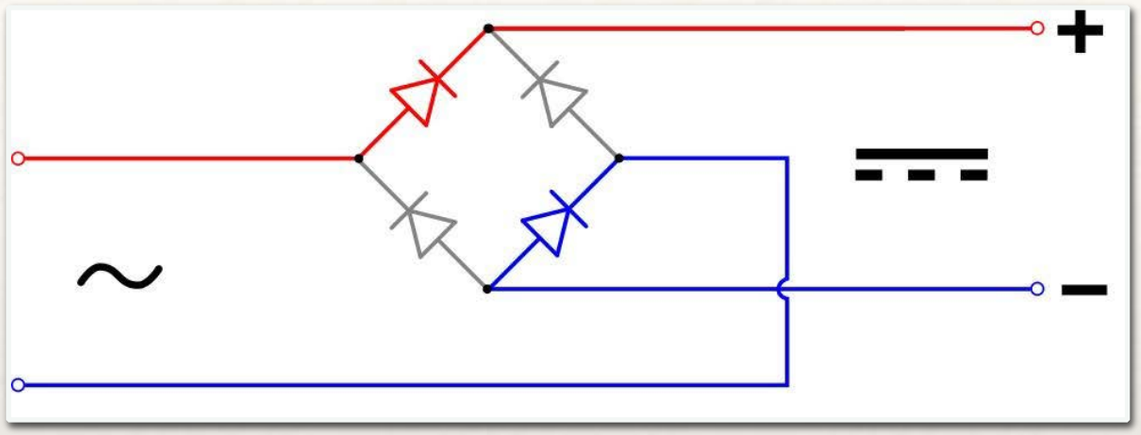
Flexibility





High Efficiency Drivers

Components + Cost



Hypothetical Bridge Rectifier Circuit

100W Device	25W Device
1% Loss 1W Circuit Dissipation	1.6% Loss 0.4W Circuit Dissipation
$0.xx	$0.xx * ½

High Efficiency Drivers

2013 MYPP Driver Efficiency Goals
LED: 92%
OLED: 95%

93% Efficiencies

Achievable at High Wattage
(100W+ adequately loaded)

Achievable at High Voltage
(Class 1: adequately loaded)

Mid-Power

85% efficiency Available

90%+ Requires Tailoring

What are the Recent Trends?

Trend: Programmability

OPTOTRONIC®
Programmable Constant Current Dimmable LED Power Supplies

OSRAM LED CREATING TOMORROW

Key Features & Benefits

- Customer programmable with 1 mA resolution to perfectly match LED load and maximize performance
- Programming does not require powering up or connecting the power supply to AC line voltage
- Wide output current and voltage range
- Available in dimming to 1% or 10% with 0–10V dimmers
- Integrated, customer configurable, LED thermal protection feature
- Familiar standard industry housing - 5.0" x 2.4" x 1.1" (L x W x H)
- Available with mounting feet (F-style) or PEM studs (J-style) to simplify installation
- Universal Input Voltage - 120–277V AC 50/60Hz
- UL Class 2 output for safe operation

Ultimate flexibility for LED lighting manufacturers

Philips Xitanium Programmable LED Drivers –
a highly reliable, flexible and easy-to-use technology that can reduce SKU complexity.

ROAL living energy

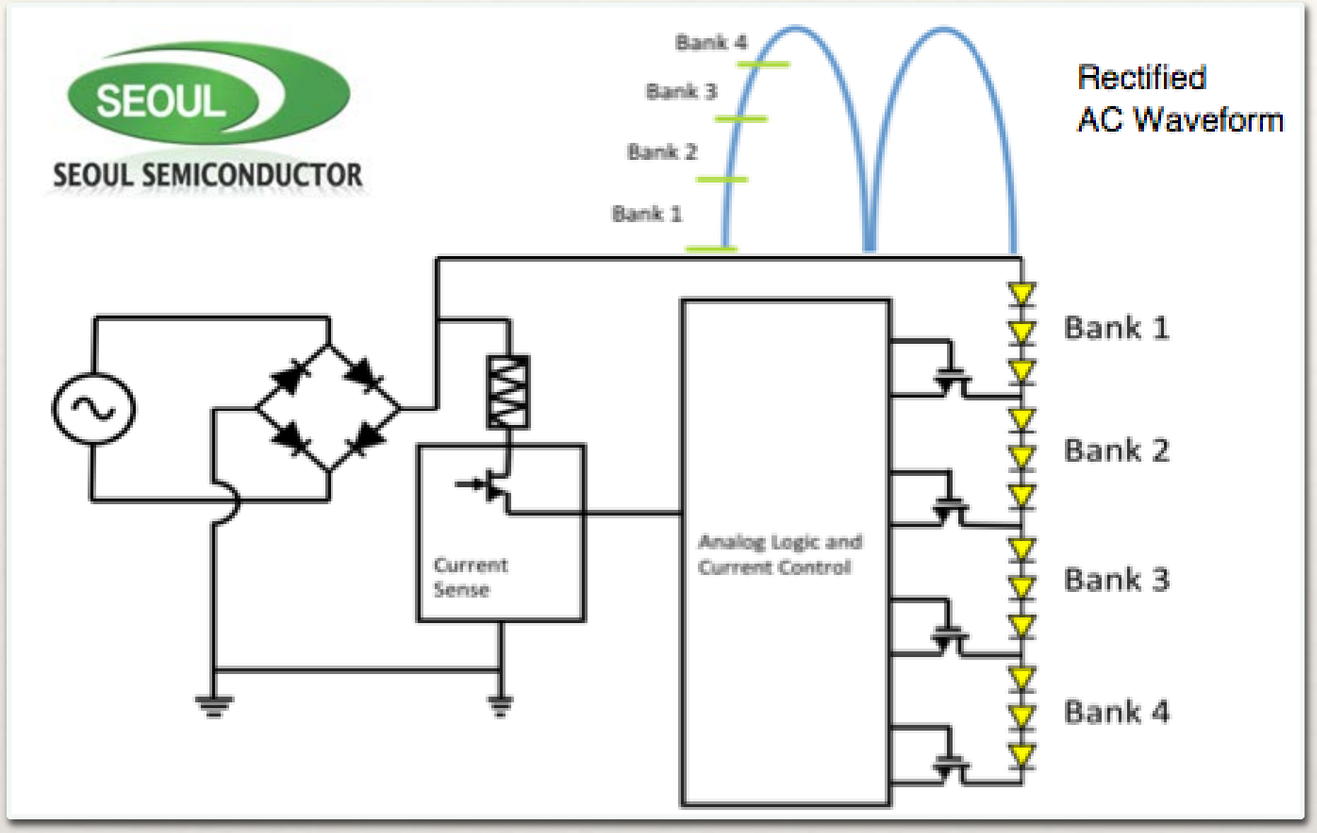
Ozone LED Driv
with Universal Input and Outp
70W Total Output Power, Single Chan

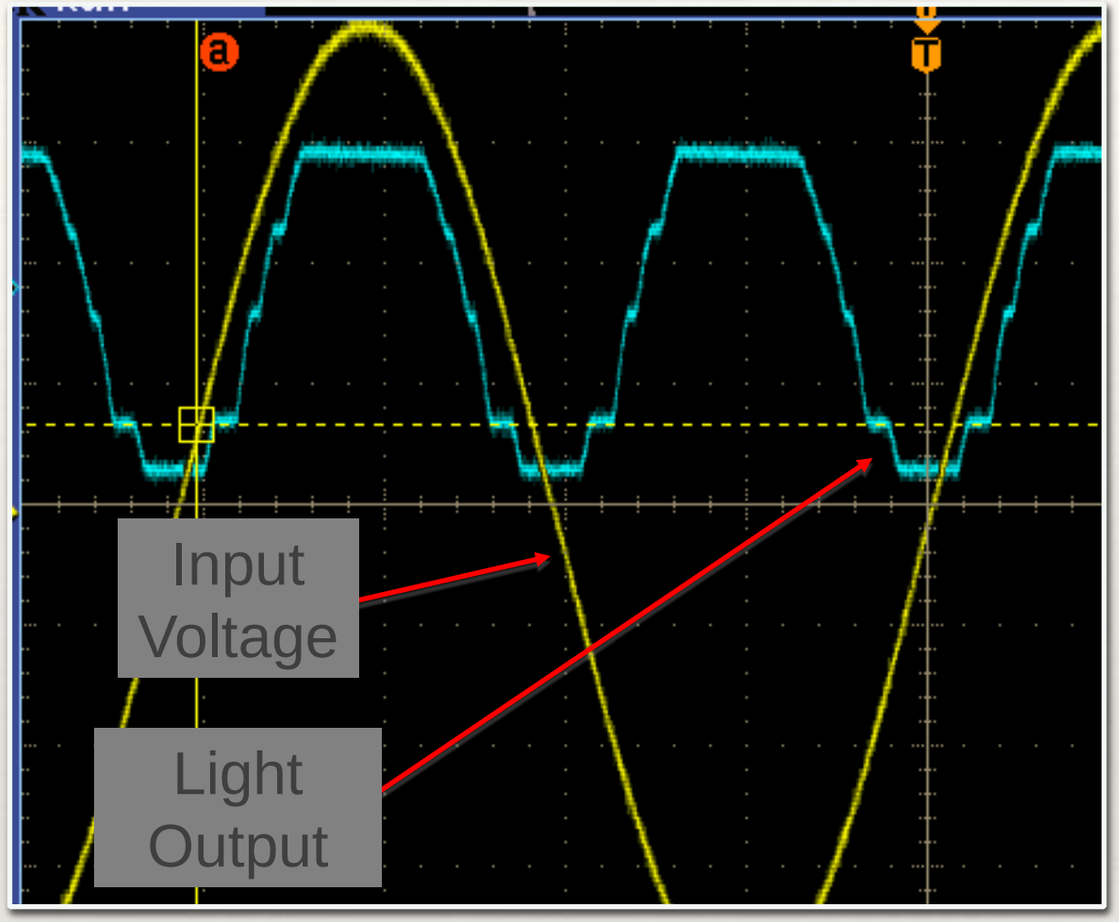
Features

Ozone LED drivers are designed to make LED fixture design easy. With universal input voltage, wide range out
and a list of exceptional features, they take the trial and error out of LED fixture design.

- Universal Input Voltage: 120Vac / 240Vac / 277Vac
- Constant Current Output for Powering LEDs Directly
- High Efficiency, Compact Design
- Low Harmonic Distortion, Low Output Ripple Current
- Field Programmable Output Current
- DALI Compatible (IEC 62386)
- Dimmable Output Current (Linear or PWM Dimming)
- Multiple Device Protections and LEDs Over Temperature Protection
- Convection Cooled, Wide Operative Temperature Range

Trend: Direct AC Solutions

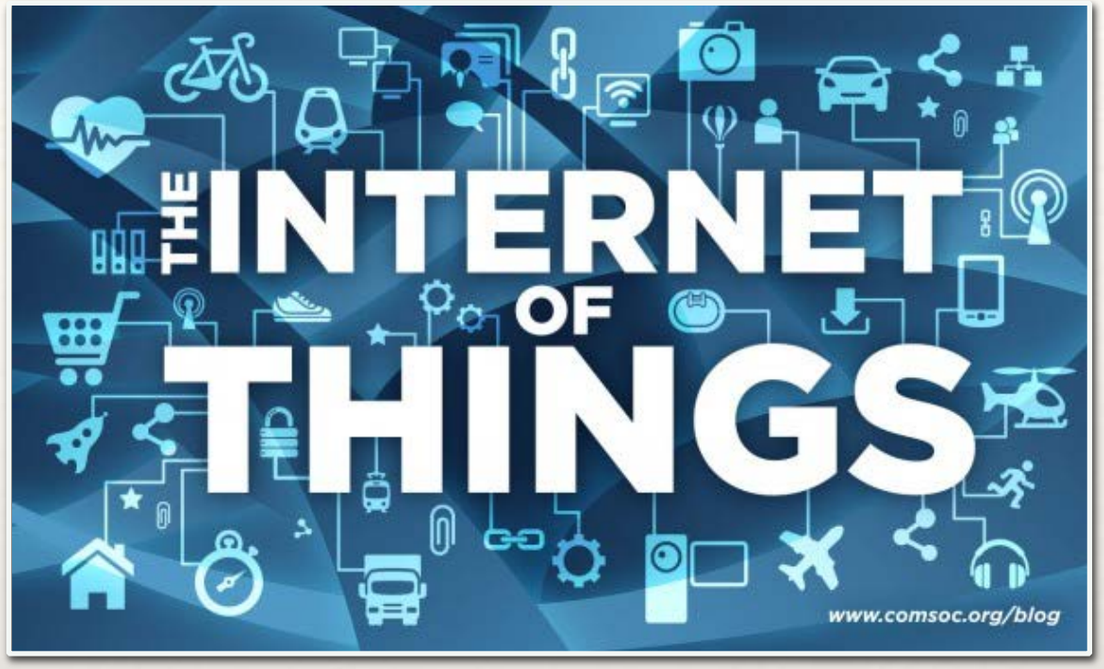




Type	Turn-On Volts	Off Time
Single-String	54V	36% Off
Two-Step	31V	22% Off
Four-Step	14.8V	12% Off

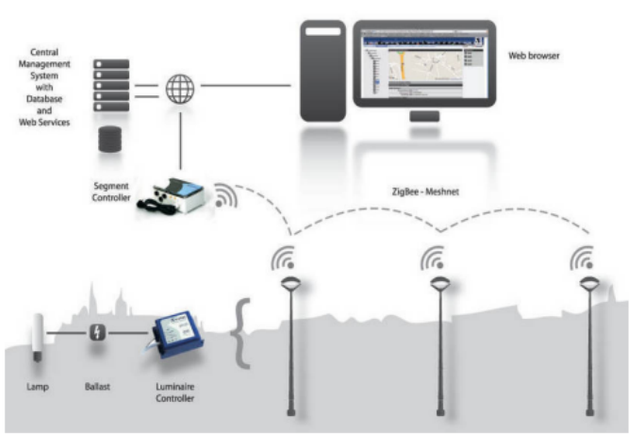
Trend: Multi-Stage

Trend: Communication

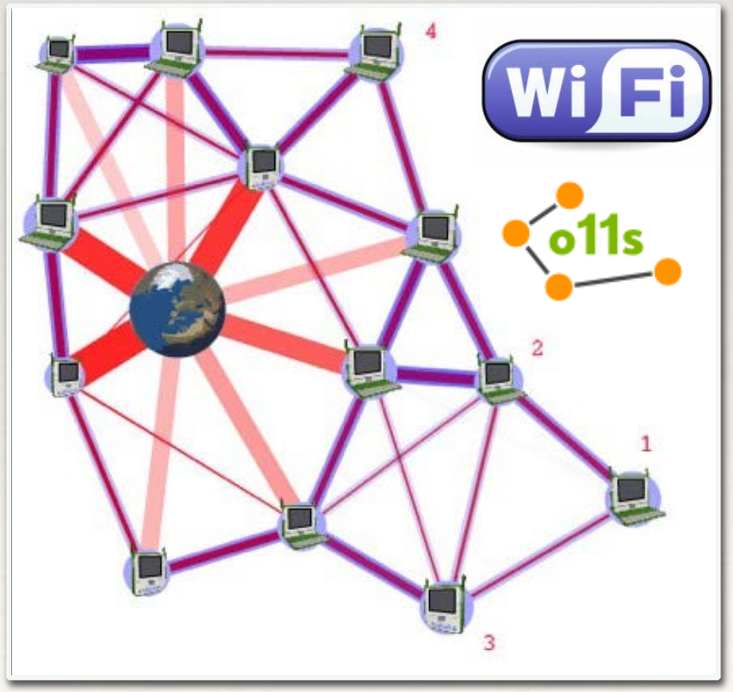


Streetlight Controls

- Wireless networks:
  - Remote on/off
  - Customized lighting schedules
  - Outage detection/ maintenance alarms
  - Energy metering
- Reduced maintenance



Source: http://www.owlet-streetlight.de/english/owlet/



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DoE SSL R&D Workshop 2014

Thank You
Yavor Kolarov, Osram Sylvania
Jack Lula/Robert Zamora, XenerQi
Dave Neal, Seoul Semiconductor
Ed Rodriguez, Opto Thermal Technologies
Patrick Rubega, WPG Americas

Jeremy Yon, LC
Manager, Product Innovation
jeremy.yon@litecontrol.com